Understanding Antimicrobial Susceptibility Testing (AST)

What Is AST?

Antimicrobial susceptibility testing (AST) helps to predict the likelihood that parenteral or oral antimicrobial therapy will be effective when used according to approved dosing recommendations. AST does not predict response to topical treatment. AST results should always be interpreted alongside patient history, clinical signs, infection site, pharmacokinetics and professional judgement.

Why Are Only Certain Drugs Reported?

- Breakpoints are unavailable, unreliable, or cannot be interpreted from the test method used
- Antimicrobials intrinsically resistant are suppressed
- AST not performed on bacterial isolates of uncertain clinical significance or representing contamination
- Encourage use of appropriate first-line therapy
- Some agents are interpreted through surrogate testing and may not be reported individually
- Antimicrobials of last resort for humans are excluded from reporting

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NDSU VETERINARY DIAGNOSTIC LABORATORY

AST Result Interpretations

Susceptible (S)

The organism is likely to respond to treatment when administered according to recommended regimens and adequate drug exposure is achieved.

Susceptible Dose-Dependent (SDD)

Clinical success is expected when a specified dosing regimen is used to achieve higher drug exposure. Standard dosing regimens may not be sufficient.

Intermediate (I)

Clinical success may still be possible when drug exposure is increased, when the drug concentrates at the site of infection, or under specific clinical circumstances.

Resistant (R)

The organism is unlikely to respond to treatment because achievable drug concentrations are not expected to inhibit growth effectively.

Intrinsic Resistance

Some bacteria are naturally resistant to specific antimicrobials, regardless of AST. When intrinsic resistance is recognized, those drugs may be suppressed or reported as resistant because treatment failure is expected.

Important Considerations

AST results predict the response of the bacterium to the antimicrobial-not the response to the disease. Treatment success may also be influenced by:

- Infection site
- Host immune status
- Presence of foreign material or biofilm
- Drug absorption and distribution
- Surgical or medical management

Susceptibility results should be interpreted in the context of the patient, infection site, drug exposure, and available treatment alternatives.

How Are Breakpoints Established?

AST results can only be interpreted using clinical breakpoints, which are minimum inhibitory concentrations (MIC) or zone diameter values that categorize organisms as susceptible, intermediate, or resistant.

Breakpoints are established using multiple sources of evidence, including:

- Pharmacokinetics (PK)/Pharmacodynamics (PD)
- MIC distributions of bacterial populations
- Mechanisms of resistance
- Expert scientific review
- Clinical outcome data

Because these factors differ among bacterial species, drugs, animal species, and infection sites, breakpoints can vary considerably between organisms and animal species.

Species and body site specific breakpoints may not be available for a specific antimicrobials due to insufficient data availability.

Who Determines Breakpoints?

Veterinary laboratories generally follow breakpoints established by the Clinical and Laboratory Standards Institute (CLSI).

CLSI veterinary committees include experts from academia, diagnostic laboratories, industry, regulatory agencies, and clinical practice who review emerging evidence and update standards as new data becomes available.

What does AST NOT tell us?

- Response to topical treatment
- Duration of treatment
- Need for surgery or source control
- Whether an infection is clinically significant
- The need for underlying disease management
- Factors of affecting antimicrobial delivery or metabolism, i.e., renal or hepatic insufficiency, biofilms

Questions?

Contact the laboratory at 701-231-8307 if additional interpretation is needed.

Common Misconceptions

"Susceptible means treatment is guaranteed to work."
No. AST predicts bacterial response under expected drug exposure conditions but cannot account for all patient and disease factors. Bacterial susceptibility doesn't necessarily predict clinical success.

"Resistant means the drug will not work."
No. Resistance indicates that clinically achievable concentrations are unlikely to be effective using established dosing recommendations. Topical therapy may still be effective because local drug concentrations can exceed those achieved with systemic treatment.

"A lower MIC is always a better drug choice."
Not necessarily. Drug selection should also consider infection site, approved indications, tissue penetration, patient factors, withdrawal times, and stewardship principles.

"If a drug is not reported, the organism must be resistant."
Not necessarily. Drugs may be omitted because of lack of an applicable breakpoint, intrinsic resistance concerns, or because another drug provides equivalent information.

Frequently Asked Questions

Why do breakpoints differ between organisms?
Breakpoints are established using organism-specific and drug-specific data. A susceptible MIC for one bacterial species may be resistant for another.

Why do some reports include comments?
Comments may provide additional interpretation regarding intrinsic resistance, known resistance mechanisms, breakpoint limitations, or stewardship considerations.

What if all antimicrobials listed are resistant?

- Topical or localized treatment options may still be effective.
- Contact with your diagnostic laboratory to identify other potential options.

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